II. "Description of the Fossil Tusk of an extinct Proboscidian Mammal (*Notelephas australis*, Ow.), from Queensland, Australia." By Professor Owen, C.B., F.R.S., &c. Received March 21, 1882.

(Abstract.)

The author, after referring to the notice of the finding of a molar tooth of a mastodon, in Australia, by Count Strzelecki, in his "Physical Description of New South Wales," p. 312, proceeds to the details of the first evidence of a proboscidian mammal which has reached him from that continent since the date (1845) of the Count's work. This evidence consists of portions of a tusk indicative of an elephantine animal, somewhat less than the existing ones of Asia and Africa. The evidences of the ivory nature of the tusk are given in detail, including the minute characters of that variety of dentine. Figures of the fossil and of the microscopical sections accompany the paper.

The specimen was discovered by Mr. Fred. N. Isaac, in a "drift-deposit of a ravine in a district of Darling Downs, sixty miles to the eastward of Moreton Bay, Queensland, Australia."

III. "Action of Ethylene Chlorhydrin upon the Bases of the Pyridine Series and on Quinoline." By Professor Adolph Wurtz, For. Mem. R.S. Received March 17, 1882.

According to the constitution which is generally attributed to the bases of the pyridine series, they must be considered as tertiary bases, their nitrogen being united to the carbon by three atomicities. The action which alcoholic iodides exert upon these bases, as shown by Hofmann, confirms this idea, which is equally applicable to quinoline. I thought that the reaction of glycol chlorhydrin and similar compounds upon the pyridine bases and upon quinoline should produce oxygenated quaternary bases. It is known, in fact, that such a base, neurine, results from the action of ethylene chlorhydrin upon trimethylamine. The beautiful results which Ladenburg obtained recently by the reaction of chlorhydrin upon secondary bases are well known. He is still continuing these researches to the great profit of science. I myself, entering again on a line of researches which I had formally traced, will describe the results obtained by investigations undertaken in the direction indicated, with the pyridine bases and quinoline.

I had two specimens of collidine at my disposal, presenting the

The Royal Society is collaborating with JSTOR to digitize, preserve, and extend access to *Proceedings of the Royal Society of London.* www.jstor.org

same boiling-point. One obtained by the distillation of aldol-ammonia was undoubtedly identical with aldehydine of Baeyer and Ador (boiling-point 179—182° C.), the other was isolated from the pyridine bases formed by the distillation of cinchonine with hydrate of potassium; this collidine is the α-collidine (boiling-point 179—183°).* The experiments have proved that these two collidines are isomeric.

Action of Ethylene Chlorhydrin upon Aldehydine.

A mixture of these two compounds, in proportion of their molecular weights, to which a quantity of water weighing as much as the aldehydine employed was added, was heated during several days in closed tubes to 100° C. The oily layer which floated on the mixture at the end of the operation, continually decreased and finally disappeared after cooling. The aqueous liquid, which was slightly brown, was extracted with ether, and finally evaporated in the vacuum. The ether had dissolved a small quantity of unattacked aldehydine and chlorhydrin. The chlorohydrate, concentrated by evaporation, was mixed with an excess of platinum chloride, and alcohol was added to the mixture. An abundant crystalline precipitate was obtained, and was purified by several crystallisations in hot water. In this manner magnificent voluminous orange-red crystals of chloroplatinate of oxethyle-aldehydine were obtained. Their analyses furnished the following numbers:—

	Experiment.			Theory.
	I.	II.	III.	
Carbon.....	32·65	32·80	31·90	32·33
Hydrogen.....	4·46	4·45	4·53	4·31
Nitrogen.....	4·10	4·22	„	3·77
Chlorine.....	28·24	„	„	28·70
Platinum.....	26·30	„	25·84	26·27

The Analysis III, which is the most accurate, was executed with a salt which had been dried in the vacuum; when this salt is heated to 100° C. it loses hydrochloric acid, which tends to augment the proportion of carbon and of platinum. The Specimen III, after having been heated to 100° during some time, contains 28·2 per cent. of platinum. This alteration, which is more marked in the case of the chloroplatinate of oxethyl-collidine, will be examined later on. The results of these analyses lead to the formula $(C_{10}H_{16}NOCl)_2PtCl_4$, which is that of a chloroplatinate of oxethyl-aldehydine—

$$\left[C_8H_{11}\overset{v}{N}<\begin{matrix}OC_2H_5\\Cl\end{matrix}\right]_2 PtCl_4.$$

* The β-collidine which Mr. Oechsner de Coninck found amongst the cinchonine bases boils at 198°.

This chloroplatinate forms magnificent orange-red crystals of clinorhombic aspect. It is quite soluble in hot water, and the concentrated boiling solution, when it cools, becomes cloudy, by depositing oily drops which finally transform themselves into crystals. Decomposed in aqueous solutions by sulphuretted hydrogen, it furnishes a chloride whose solution is colourless, and does not crystallise after being evaporated during several days in the vacuum. Decomposed by oxide of silver and water it furnishes a caustic soluble base, which attracts the carbonic acid of the air.

These reactions permit no doubt as the character of the new base, which is a sort of aldehydine neurine.

Action of the Ethylene Chlorhydrin upon α-Collidine.

In order to obtain the α-collidine quaternary base corresponding to neurine the method just indicated was employed. The reaction is, however, more rapid than in the previous case; and after heating for a few hours the oily layer disappears, excepting a few black drops which still float on the liquid. The liquid on being extracted with ether, evaporated in the vacuum, and finally treated by platinum chloride, furnishes a crystalline orange-yellow precipitate less soluble in water, and much less stable than the preceding one. The analyses of this salt, dried over sulphuric acid, gave the following results:—

	Experiment.		Theory.
	I.	II.	
Carbon	31·23	..	32·23
Hydrogen	4·16	..	4·32
Platinum	26·32	26·16	26·48

The solution of this salt in hot water becomes of a deeper brown-red colour the more concentrated it becomes. On boiling it decomposes. Its solution in a large quantity of hot water, on cooling deposits orange-red crystals tinged with brown. These crystals give the following numbers when analysed:—

	Experiment.			Theory.
	I.	II.	III. Orange crystals from the mother-liquor.	
Carbon	30·39	..	31·56	32·23
Hydrogen	4·09	..	4·18	4·31
Platinum	27·48	27·02	26·33	26·48

These crystals do not possess exactly the composition of the chloroplatinate, $(C_{10}H_{16}NOCl)_2PtCl_4$, which must therefore be altered by the action of boiling water. In fact, the solution became deeply

coloured after several minutes' boiling,* and on being decomposed by sulphuretted hydrogen, furnished a solution which, after being evaporated on the water-bath and filtered, showed a brown tint, and gave after several days brownish-red crystals. These were purified by crystallisation from boiling alcohol, in which they are very slightly soluble. By the cooling of the solution a salt was obtained, which crystallises in brilliant scales, possessing a brownish tint, and corresponding exactly to the formula of a chloroplatinite of oxethyl-α-collidine, $C_{10}H_{15}(PtCl)NOCl$.

			Theory.
Carbon	35·61	.....	35·84
Hydrogen	4·79	.....	4·42
Chlorine	20·89	.....	21·30
Platinum	29·30	.....	29·42

This salt is derived from the chloroplatinate of oxethyl-α-collidine by loss of hydrochloric acid:—

$$(C_{10}H_{16}NOCl)_2PtCl_4 = 2HCl + (C_{10}H_{15}NOCl)_2PtCl_2.$$

The crude chloride of oxethyl-α-collidine, or the chloride separated from the unaltered chloroplatinate by sulphuretted hydrogen, treated with chloride of gold, furnishes an abundant precipitate, which condenses directly into dark yellow drops.† These drops soon transform themselves into crystals, which melt under hot water, but are soluble in a large quantity of boiling water. The solution, when cooled, deposits first yellow drops, then magnificent thin needles of golden-yellow colour. They are the chloroaurate of oxethyl-α-collidine, $C_{10}H_{16}NOCl.AuCl_3$.

			Theory.
Carbon	23·79	.....	23·79
Hydrogen	3·35	.....	3·17
Nitrogen	..	.....	,,
Gold	38·96	.....	38·91

Action of Ethylene Chlorhydrin upon Quinoline.

The quinoline which was employed in this experiment was obtained by distilling cinchonine with hydrate of potassium, and possessed, after a great number of rectifications, the boiling-point 238—240° C. The quinoline was heated with an equivalent quantity‡ of glycol chlorhydrin, to which its weight of water had been added. After

* In one experiment an elimination of a small quantity of platinum which blackened the liquid was noticed.

† With the crude chloride a dark coloration, due to a reduction of the gold salt by some impurity, is observed.

‡ 16 grs. of quinoline for 10 grs. of chlorhydrin.

three days' heating, the oily layer had entirely disappeared. The mixture was cooled and extracted with ether, and the aqueous solution, slightly coloured brown, was concentrated. After a few days, the solution contained a great amount of brown crystals, which were strongly pressed between layers of paper, and finally dissolved in absolute alcohol. The solution was treated with animal charcoal, filtered boiling, and, after cooling, anhydrous ether was added, so as to float on the alcoholic layer. The next day the alcoholic solution was filled with magnificent colourless prisms, some of which traversed the entire vessel. This salt is a chloride of oxethyl quinoline,

$$C_{11}H_{12}NOCl = C_9H_7\overset{v}{N}\!<\!\begin{matrix}OC_2H_5\\Cl\end{matrix},$$

formed by the addition of glycol chlorhydrin to quinoline.

					Theory.
Carbon	63·20	....	..	....	63·01
Hydrogen	5·96	....	..	....	5·72
Nitrogen	6·83	....	..	....	6·68
Chlorine	16·29	....	16·11	....	17·42

This chlorhydrate has a bitter taste, attracts the atmospheric moisture, and is very soluble in water and in alcohol, insoluble in ether. Its aqueous solution is not precipitated by ammonia, and gives with potassa a thick, coloured precipitate. Boiled for several seconds with oxide of silver, the solution forms chloride of silver and reduced silver, and the filtered liquid possesses a very strong alkaline reaction, and rapidly assumes a crimson tint. The hydrate of plumbic oxide decomposes this chloride in a similar manner. Corrosive sublimate forms with it a compound which crystallises easily.

Chloride of gold produces, in the solution of this chloride, a yellow precipitate, soluble in boiling water, from which it crystallises on cooling in small crystals, which appear under the microscope as pointed lozenges. This chloroaurate possesses the formula

$$C_{11}H_{12}NOCl,AuCl_3.$$

			Theory.
Carbon	26·21	.....	25·77
Hydrogen.....	2·94	.....	2·34
Gold	37·98	.....	38·30

Platinum chloride forms a chamois-yellow precipitate in the solution of the chloride. This precipitate is soluble in a large quantity of boiling water, and crystallises from the cold solution in small opaque orange crystals of the formula $(C_{11}H_{12}NOCl)_2PtCl_4$.

	Experiment.			Theory.
	I.	II.	III.	
Carbon	35·03	34·54	35 09	34·82
Hydrogen	3·41	3·35	3·35	3·16
Nitrogen	3·70	„	„	3·70
Chlorine	„	„	27·4	28·09
Platinum	26·09	26·8	26·9	26·0

The Specimen I was the pulverulent yellowish chloroplatinate, simply precipitated and dried in the vacuum. The others had been dissolved in boiling water, and were thereby slightly altered, as the excess of platinum proves. When quinoline is heated with an equivalent quantity of ethylene chlorhydrine without adding water, a dark purple-reddish mass is obtained. Extracted with ether, dried and treated with absolute alcohol, this mass gives a dark violet solution, which, if ether is poured on it, deposits an almost black mass, which finally crystallises. The crystals, pressed between sheets of paper, are sensibly less coloured than the mother-liquor, which imparts to the paper a dark violet colour.

I have not yet concluded the analysis of this product, and I propose to continue these researches in various directions.

IV. "On the Movement of Gas in 'Vacuum Discharges.'" By William Spottiswoode, P.R.S., and J. Fletcher Moulton, F.R.S. Received March 25, 1882.

In the preparation of tubes for our experiments it was often noticed that, after the exhaustion had been carried to a certain degree, the passage of a strong current had the effect of increasing the pressure. This appeared to be due to an expulsion of gas from the terminals themselves by the passage of the discharge. And accordingly the use of such currents from time to time during the process of exhaustion was adopted for making the vacuum more perfect and more permanent than otherwise would have been the case. On the other hand, it was also noticed, that after the tube had been taken off the pump and sealed in the usual way, the passage of a strong current had in some instances the effect of decreasing the pressure. We thus met with two effects, apparently due to the same cause, but diametrically opposite in character.

The fact of the tube being on the pump or off it did not appear to be at all material to the question, because the first effect could be obtained when the tube was temporarily shut off by a stopcock. Nor indeed did either the first or the second effect depend upon the absolute